

What is claimed is:

1. An apparatus for printing on the inside radius of a curved substrate, comprising:

a curved substrate having an inside radius for locating printing thereon;

a screen mounting frame, conformable to said substrate;

a screen secured to said screen mounting frame;

a pendulum mounted for pivotal movement above said screen; and

a squeegee connected to the end of said pendulum and adapted to selectively contact said screen during pivotal movement of said pendulum.

2. An apparatus as defined in claim 1, wherein said curved substrate has an inside radius of approximately 20 to 80 inches.

3. An apparatus as defined in claim 1, wherein said curved substrate has an inside radius of approximately 38 to 60 inches.

4. An apparatus as defined in claim 1, wherein said curved substrate, said screen mounting frame, and said pendulum are mounted within a support structure.

5. An apparatus as defined in claim 1, wherein said screen mounting frame has a front, a rear, a left side and a right side.

6. An apparatus as defined in claim 1, wherein said screen is a high tension, low elongation material capable of receiving and transferring printing ink.

7. An apparatus as defined in claim 1, wherein said screen is a monofilament polyester material.

8. An apparatus as defined in claim 1, wherein said screen mounting frame holds said screen in tension from said right side to said left side.

9. An apparatus as defined in claim 1, wherein said screen mounting frame holds said screen with substantially no tension from said front to said rear of said screen.

10. An apparatus as defined in claim 1, wherein said screen has a perimeter, a center portion, a leading portion, a trailing portion, a right portion, and a left portion.

11. An apparatus as defined in claim 10, wherein said screen perimeter is secured to said screen mounting frame by adhesive.

12. An apparatus as defined in claim 4, wherein said support structure has at least one flange for locating thereon said screen mounting frame.

13. An apparatus as defined in claim 12, wherein a horizontal portion of said at least one flange has a plurality of apertures.

14. An apparatus as defined in claim 13, wherein said at least one flange accommodates at least one spacer within said plurality of apertures for locating thereon said screen mounting frame for increasing the distance between said curved substrate and said center portion of said screen.

15. An apparatus as defined in claim 5, wherein both said left and right sides of said screen mounting frame have a vertically movable center portion and at least two vertically movable end portions.

16. An apparatus as defined in claim 15, wherein said center portion is bounded by at least two hinges.

17. An apparatus as defined in claim 16, wherein said center portion is removably attached to means for vertical movement.

18. An apparatus as defined in claim 17, wherein said center portion is removably attached to said vertically moving means by at least one clamp.

19. An apparatus as defined in claim 17, wherein said center portion is removably attached to said vertically moving means by at a screen mounting frame locator.

20. An apparatus as defined in claim 19, wherein said screen mounting frame locator has means for adjusting the location of said screen mounting frame with respect to said substrate.

5 21. An apparatus as defined in claim 20, wherein said means for adjusting the location of said screen mounting frame with respect to said substrate are manual.

22. An apparatus as defined in claim 20, wherein said means for adjusting the location of said screen mounting frame with respect to said substrate are computer activated.

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23. An apparatus as defined in claim 17, wherein said means for vertical movement is at least one fluid driven cylinder.

24. An apparatus as defined in claim 15, wherein said end portions are removably attached to
15 said support structure with pivotal clamps.

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25. An apparatus for printing on the inside radius of a curved substrate comprising:

a curved substrate having an inside radius for locating printing thereon;

a screen mounting frame, conformable to said substrate;

5 a screen secured to said screen mounting frame;

a pendulum adjustably mounted above said screen, allowing said pendulum to travel through a plurality of radii;

a squeegee connected to the end of said pendulum and adapted to selectively contact said screen during pivotal movement of said pendulum.

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26. An apparatus as defined in claim 25, wherein said pendulum has at least one pivotal mounting to said support structure.

27. An apparatus as defined in claim 25, wherein said radii are approximately 20 to 80 inches

15 measured from said pivotal mounting to said curved substrate.

28. An apparatus as defined in claim 27, wherein said radii are approximately 38 to 60 inches measured from said pivotal mounting to said curved substrate.

20 29. An apparatus as defined in claim 26, wherein said pivotal mounting is connected to a pivotal mounting bar located on said pendulum and to a pivotal mounting bar located on said support structure.

30. An apparatus as defined in claim 29, wherein said pivotal mounting is releasably attached to said pendulum pivotal mounting bar and said support structure pivotal mounting bar to create a pivot point about said pivotal mounting for said pendulum.

5 31. An apparatus as defined in claim 25, further comprising indicating means for indicating the radius of said pendulum.

32. An apparatus as defined in claim 31, wherein said indicating means includes an indicator connected to said pivotal mounting and an index connected to said support structure.

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33. An apparatus as defined in claim 30, wherein pendulum has at least one locking rod for locking said pendulum to said support structure while said at least one pivotal mounting is adjusted.

15 34. An apparatus as defined in claim 25, wherein said pendulum is connected to translation means for translating said pendulum across said screen.

35. An apparatus as defined in claim 34, wherein said translation means includes at least one carriage moveably located on said support structure and connected to said pendulum.

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36. An apparatus as defined in claim 35, wherein said at least one carriage is computer actuated.

37. An apparatus as defined in claim 36, wherein said pendulum translates over a cam within said carriage as said carriage translates along said frame.

38. An apparatus as defined in claim 37, wherein said cam adjusts for the varying vertical position of said pendulum as said pendulum translates across said screen.

39. An apparatus as defined in claim 38, wherein said carriage translates across said frame according to belt driven means.

40. An apparatus as defined in claim 25, further comprising a flood bar connected to said pendulum.

41. An apparatus as defined in claim 40, wherein said flood bar is an aluminum alloy.

42. An apparatus as defined in claim 40, wherein said flood bar is connected to means located on said pendulum for raising and lowering said flood bar to said screen.

43. An apparatus as defined in claim 42, wherein said means for raising and lowering said flood bar is at least one fluid driven cylinder.

44. An apparatus as defined in claim 43, wherein said cylinder is computer actuated.

45. An apparatus as defined in claim 25, wherein said squeegee is attached to means located on said pendulum for raising and lowering said squeegee to said screen.

46. An apparatus as defined in claim 45, wherein said means for raising and lowering said
5 squeegee is at least one fluid driven cylinder.

47. An apparatus as defined in claim 46, wherein said cylinder is computer actuated.

48. An apparatus as defined in claim 25, wherein said squeegee is a polyurethane material.

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49. An apparatus as defined in claim 25, wherein said squeegee is pivotally attached to said pendulum.

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50. An apparatus for printing on the inside radius of a curved substrate, comprising:

a curved substrate having an inside radius for locating printing thereon;

a screen mounting frame, conformable to said substrate;

5 a screen secured to said screen mounting frame;

a pendulum mounted for pivotal movement above said screen; and

a squeegee connected to the end of said pendulum and adapted to selectively contact said screen during pivotal movement of said pendulum; and

a support member adapted to support said curved substrate, said support member having

10 an upper surface with a curvature which substantially conforms to the curvature of said curved substrate.

51. An apparatus as defined in claim 50, wherein said screen has at least two crosshairs located thereon for alignment with at least two crosshairs located on said support member.

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52. An apparatus as defined in claim 50, wherein said upper surface is a polycarbonate material.

53. An apparatus as defined in claim 52, wherein said upper surface has a recess substantially conforming to said shape and curvature of said curved substrate.

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54. An apparatus as defined in claim 50, wherein said support member has a plurality of fixed support bars located beneath said upper surface.

55. An apparatus as defined in claim 50, wherein said support member has a plurality of adjustable support bars located beneath said upper surface.

56. An apparatus as defined in claim 55, wherein said adjustable support bars are pivotally
5 mounted, vertically adjustable located proximate said upper surface.

57. An apparatus as defined in claim 53, wherein a vacuum secures said curved substrate into said recess.

10 58. An apparatus as defined in claim 57, wherein said upper surface has a plurality of apertures in said recess in communication with said vacuum source.

59. An apparatus as defined in claim 53, wherein a locking tab located on said substrate urges said curved substrate into said recess.

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60. An apparatus as defined in claim 50, wherein said support member is adapted for horizontal and vertical movement.

61. An apparatus as defined in claim 60, wherein said support member has a plurality of
20 wheels engaged with at least one track located on said support structure to effect horizontal movement of said support member.

62. An apparatus as defined in claim 61, wherein said support member is connected to a motor to effect horizontal movement of said support member.

63. An apparatus as defined in claim 61, wherein said horizontal movement is effected manually.

64. An apparatus as defined in claim 60, wherein said support member has at least one fluid driven cylinder located on said support structure and connected to said support member to effect vertical movement of said support member.

65. An apparatus as defined in claim 64, wherein said at least one cylinder is computer actuated.

66. An apparatus as defined in claim 50, wherein said support member has at least one locking means for preventing lateral movement of said support member.

67. An apparatus as defined in claim 66, wherein said locking means is a spring-loaded catch located on said support member for engagement with a complimentary receiver.